

pmTUC STUDENT NEWS

My research internship at pmIndia Innovation Lab in Manipal

Saskia Münster, M.Sc. student in Print and Media Technology at Chemnitz University of Technology, is currently doing a 3-month research internship at our new Indo-German R&D lab at Manipal University. Here she writes about her project and experiences.

I was interested to go to India since I had come to know that there exists an exchange programme for students between the Institute for Print and Media Technology of Chemnitz University of Technology and Manipal University. India itself as an advanced developing country is usually not the first choice for students to go abroad, but for me this was one of the main points – to do something different. Furthermore, I was eager to get the opportunity to learn and work in a totally new and diverse culture and get to know other working principles far away from Europe. I kept this possibility to go abroad in my mind and decided after my Bachelor's thesis to continue with Master studies at Chemnitz University of Technology.

The main reason for my decision to apply for a research internship in India was the fact that the new pmIndia Innovation Lab had been established and opened in Manipal in January 2013. On the basis of this I had planned to apply for an internship after my last practical semester and after the last exams. In particular, I wanted to have the opportunity to get more knowledge in the research field of printed solar cells. I had already learned a lot about solar cells and other printed electronic devices during my Master's course in Chemnitz. For me the internship in the Innovation Lab is the perfect chance to combine the learned

basics about organic photovoltaics with practical research in this field. Together with colleagues from pmTUC and Manipal we discussed my main task schedule, which focuses on the evaluation of solar cells, printed in Chemnitz, under different conditions. The lifetime measurement is split into three main parts. First, I start with the degradation measurement of the solar cells in the dark, and, parallel to this, I continue with a long-life time measurement under the influence of different light sources. After this the third part includes the examination of temperature influences related to degradation. Especially during the first week it was really nice for me to work together with my colleagues on the measurement setup, which also included some handcraft work, like soldering or crimping. Besides the measurements I work on the analysis and do literature research to understand what happens with the solar cells. During my work in our modern lab, I got the opportunity to use measurement devices, especially the new sun simulator, to characterise solar cells.

Personally, it is a good experience to see and get to know the cultural differences in research work in India and Germany. I think for the Indians it was a little bit strange in the beginning to work together with a European woman and I felt a little observed during my work and thought that they did not take me so serious but after some days and some small talk it changed to interest for my research project and acceptance. For me it was strange to get off the shoes before you enter the lab and go barefoot, but I got used to it and I think I will miss it when I am back in a German lab, because it conveys the feeling of something homelike or even holly-like working atmosphere.

My research internship in India covers much more than I have expected before. It is not only the new cultural experiences and the work in the lab, it is also representing pmTUC of Chemnitz University of Technology. It often happens that interested students come to me on the campus and ask me what I am doing here in the Innovation Lab in Manipal. Or delegations from other universities visit the Innovation Lab and are interested in the research of our group. Furthermore, it has given me the opportunity to learn about how to solve problems or how to work on something in a more relaxed way. I am really thankful that it was possible to do the internship here in the Innovation Lab. My colleagues and the other employees and students I have met during my work were always very friendly and open-minded and I had never the feeling to be at the wrong place!

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pmTUC PROJECT NEWS

Disposable ultra-cheap printed paper photovoltaics (DUC3PV)

Our recently started project, DUC3PV, aims to develop ultra-cheap disposable organic photovoltaics (OPV) on paper substrate by roll-to-roll printing methods. OPV with a moderate power conversion efficiency (PCE) of 4-8% and a short lifetime of 1-2 years can be compared with plant leaves with a typical efficiency of 3-7% and a lifetime of about one year.

All the current research approaches for OPV are directed towards increasing PCE >10% and lifetime up to 20 years in order to match it with long-lasting state-of-the-art silicon PV. However, there is an absolute vacuum in the market for use-and-throw PV. The DUC3PV project aims to bring a new concept in PV industry and fill this vacuum by ultra-cheap disposable OPV. The aim is to develop a simple and cost-effective process for OPV that can be printed by a printer anywhere in the world and simultaneously to develop an OPV that can be handled by a common man without any sophisticated technical skills. In order to achieve the goal of use-and-throw OPV, the following strategies are planned in the DUC3PV project:

- 1) Paper substrate is used. In flexible electronics, substrates constitute more than 90% by volume. Paper is cheap (~0.1 €/m²) compared to plastic substrates such as PET (~1 €/m²). Moreover, paper is eco-friendly and biodegradable.
- 2) Indium-tin-oxide and silver free OPV.
- 3) Organic materials that can easily be disposed are preferred. The existing waste management system will be able to dispose/recycle paper OPV systems.
- 4) All processes are based on energy-efficient and cost-effective roll-to-roll printing methods.
- 5) No laser structuring (expensive) or acid based structuring (environmentally harmful) are used.
- 6) Inexpensive and eco-friendly encapsulation with adequate barrier properties is applied for a lifetime of > 2 years.

In this project five European partners – two industries and three research institutes – are involved. MA

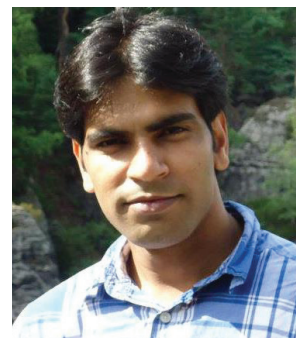
FURTHER NEWS

New researcher at pmTUC

Hello! I am Pradeep Kumar Singh, a new research assistant at the Institute for Print and Media Technology, Chemnitz Germany. I will mainly be involved in the development of printed solar cells, specifically focusing on the issues pertaining with efficiency, contact electrodes, lifetime and integration. Prior to

joining pmTUC, I was a Ph.D. student at the Institute of Physics of Chemnitz University of Technology. During my doctoral work, I was responsible for the electron microscopy characterization of low-k dielectrics. I extensively worked on transmission electron microscopy and scanning electron microscopy and accomplished meticulous related analysis. Furthermore, I got a handful industrial exposure during my tenure at Videocon R&D center, Mumbai, India, where I explored the avenues for development of solar cell and LCD display technology.

I pursued my Master of Technology in Solid State Materials from Indian Institute of Technology Delhi, India. I belong to one of the most spiritual and oldest living cities, Varanasi or Benaras, a district in Uttar Pradesh, India. PKS



Project meeting of German research presences in Asia

From 13 to 14 May, project representatives of the BMBF initiative for the establishment of joint research structures of German universities with partners in the Asia Pacific Research Area (APRA) met in Bonn, Germany. Prof. Hübler was invited to present our Indo-German activities that are partly funded in this programme. In particular, he spoke about the pmIndia Innovation Lab in Manipal and joint research activities on printed paper solar cells. We also got information on other projects, e.g. by KIT Karlsruhe, TU Munich and FSU Jena. The diversity of projects brought up fruitful discussions and the nearly 50 participants got a lot of new ideas on how to proceed with their projects. Further information on all projects is available in the BMBF brochure "German Research Presence in Asia" that can be downloaded on our pmIndia website. CS

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